The Roadside Solar Array:

The Roadside Solar Array is as it sounds. A solar array designed specifically for installation along highway and roadway mediums without presenting interference to the traffic associated with these systems. The Array consists (but is not limited to) 50, 312.732W Fresnel Lensed Photovoltaic Cells, housed above traffic level in a central rotating array frame. It is supported and rooted into the ground via two vertical supports, as well as underground concrete blocks. Each array has the potential to produce 15.6363KW in optimal sunlight, and will rotate along a central axis to gain access to optimal light throughout the day. Each Array has an irradiance sensor housed on the left vertical support which works in conjunction with an electric (DC) motor which rotates the array to maintain optimal surface light ratios. Each Array is also fitted with a double sided advertisement box for use when installed either in town, along roadways, or even railways. Additional revenue is generated through renting advertisement space on each array and as the arrays mentioned and described will be installed in high traffic areas this will provide an optimal audience for the advertisement in place.

Each Array collects power from the sun (making it a renewable energy source) and transmits this power via underground HVDC line (High Voltage Direct Current). This line is attached to the array via bored holes in the vertical supports (underground) and are connected via intermediary cable which can be accessed at both of it's connection points via access hatches or via underground access tunnel (shown in illustrations provided). Each access hatch requires and is designed to have an in place locking mechanism to deter tampering. The photovoltaic cells themselves are housed around (but not limited to) 20 feet above ground level in a bracketed aluminum frame to allow for easy access to panels when required by maintenance staff, or by installation crews. Should any issue arise with one or more cells there are access hatches on either side of the under section of the rotating central array as well as a locking mechanism on the left side of the array to prevent theft of panels. All one has to do is determine which panel is bad then slide out the cells until the desired cells is reached, then replace the bad cell with a new one and slide the other cells back into their places. Each cell connects to an electrical connector box (housed internally, to prevent unwanted tampering) which are in turn connected to an internally housed intermediary line which runs through the center of the rotating array down to ground level via the right vertical support where it in turn is connected to another intermediary line, which is also connected to the underground main HVDC transmission line.

The Array Described in the above paragraphs as well as in the technical illustrations provided with this document have been designed from the ground up by myself, Nathan Kirk Ian Whipple. As of June the 23rd of 2013 these designs are under the protection provided by the USPTO. Status on the Patent is still pending.

One should note that however the design is in the Patent process a prototype has yet to been constructed. Research and development may be required to design an electric motor that can rotate the array's central rotating housing. Please note that while any specific descriptions of the electric motor used to rotate the array's central rotating housing have been generalized to state that "a DC electric motor will be used for this process (the process of rotating the central rotating array). The use of an electric motor to rotate the central rotating housing has been accounted for in the design patent application, and have been noted in the illustrations, as well as it is understood that development of a motor specific to the purpose of rotating the central rotating array has been considered.

SPEC. SEET:

45.601ft/array (linear)

5,280ft/mile

115 array(s)/mile

15.6363 KW/ Array (peak)

COST:

(*price reduction for panels bought in bulk not factored into price estimate, nor is it for other materials and components). (Only item bulk purchase pricing does not affect is HVDC line).

50 (cells) @ $938.20/cell: ($3.00/W)	= $46,916.00
Steel:(includes $500.00 to manufacture/support)	= $1,743.74
Aluminum:(includes $1,000 to manufacture frame)	= $1,658.27
HVCD @ $189.39/foot @ 45.601ft:	= $8,636.37
Motor, Irradiance Sensor, Actuator, Control System, Bearings:	= $15,000.00
Plexiglass:(includes $400.00 to manufacture)	= $1,326.16
Concrete:(includes $400.00 to manufacture on site)	= $1,507.96
	= $76,788.50/array (material/component cost)

+labor and equipment:

10 man team @60.00/hour for 10 hours @4 days/week:	= $24,000.00/week (4 days/week)
	= $936,000.00/ 39 weeks/year
$64,000 equipment rental/usage/day:	= $64,000.00/day/crew
	= $256,000.00/week/crew (as described)
	= $9,984,000.00/ 39 weeks/year/crew
Total labor costs:	= $10,920,000.00 / 39 weeks/year/crew
Estimated Time to Install (1) Array:	= (1) week

Total Cost/Array: = $100,000.00 (material retail price before install)

Projected Retail Price: = $380,000.00 (includes installation of Array/Arrays)

ENERGY PRODUCED:

(15.6363KW/array@ peak)(3,600s): = 56,290.68 KW/hour/array

Winter Pricing of electricity: @ $0.159/KWh = $8,950.218 (8,950.22)

@ 5 hours/day = $44,751.09

@ 7 days = $313,257.63

@ 20 weeks = $6,265,152.60

(Weather constraints) @ 45% efficiency = $3,445,833.93

Summer Pricing of electricity:@ 1.5h @ $0.20/KWh = $16,887.204

@ 3.5h @ $0.224/KWh = $44,131.893

@ 5.5h @ $0.321/KWh = $99,381.195

@ 1day = $160,400.292

@ 1 week = $1,122,802.044

@ 28 weeks = $31,438,457.23

Annual Production Based on Average year KWh price: = $0.11865/KWh average cost from utility

Revenue Generated from sale of electricity to public by utility:

(56,290.69KW/h)(0.18856)(6)(7)(52) = (Xu) = $23,181,348.64 (Xu)

(Xu)(0.45) = Yu ($10,431,606.89), (Xu) – (Yu) = Rev./Year = $12,749,741.75 (annual revenue)

Revenue Generated from sale of electricity to utility:

(56,290.68KW/h)(0.08$/KWh)(6h/day)(7 days)(52 weeks)=X = $9,835,107.61

(X)(0.45)=Y ($4,425,798.424), (X) – (Y) = Revenue/year = $5,409,309.186

Profit margin from producer to utility: = $7,340,432.564

ADDITIONAL REVENUE: (Per Array)

Advertisements @ 2/ array: = 2

@ $1,500.00 / month/ad: = $3,000.00

@ ½ utilization: = $1,500.00

@ 12 months full utilization: = $36,000.00

@ 12 months @ ½ utilization: = $18,000.00

REVENUE PRODUCTION/ARRAY:

Electricity Revenue:	= $5,409,309.186 (Annual)(@$0.08/KWh)
Advertisement Revenue:	= $36,000.00 (12 month full utilization)
	= $18,000.00 (12 months ½ utilization)
Total:	= $5,445,309.186 (12 month full utilization)
	= $5,427,309.186 (12 month ½ utilization)
$/KWh: (based on est. wholesale price):	= $3.5529/KWh
$/Hour/Advertisement @ $1,500.00/Ad:	= $2.08

(Please Note)

The phrase "time until profitable" is used to determine how long it takes for the Array/Arrays to produce enough income to have paid for either their construction (estimated price), or time until the Array/Arrays have paid for their construction, installation, and manufacture. This time frame is likely to change due to changes in costs to produce, manufacture, or install. All prices should be associated with a (+/-) figure of $10,000.00 - $20,000.00 difference due to availability and demand of materials required to manufacture, construct, or install. Although calculations done to generate the figures provided are based on an estimated price this price as mentioned before may fluctuate. The estimated price is more likely to be the price associated with individual and multiple array systems and has been generated based on the average cost of materials required to produce the array/arrays.

All electrical pricing (KWh) is based on the information provided by PG&E on their main website and an average yearly KWh price has been determined by the summation and division of these varying prices. The average yearly price/KWh as mentioned in the sections above is $0.18865) however this price is also due to change based on economic factors as well. To retain simplicity in this guide to costs/revenues associated with the Arrays described in this document average costs and time estimates have been made, although these estimates may not be accurate to the tenth of a cent they are in fact quite close to the general figures that are mentioned in this guide. Allowances for cost differentials have been made however not calculated to ensure the simplicity of this guide.

All technical drawings are protected intellectual property of Nathan Kirk Ian Whipple, and are provided to serve as a visual reference to the before described Roadside Solar Array. All drawings, if to be viewed correctly, must be done so that the lettered print on the page conforms with the English Standard (i.e. top left to bottom right). If being correctly viewed all letters and figure numbers will be viewed as they would appear in any text format. (side note: all drawings are printed on the page horizontally).

Under no circumstances are you, the authorized recipient of this document granted rights bestowed by the USPTO to the intellectual property described and illustrated in this document.

While illegal for any state or government establishment or entity to profit from any product or installation along public land, it is not illegal for private parties to do so. In concordance with this law all revenue and rights pertinent to the system described in this document will be the property of the sole inventor, myself, Nathan Kirk Ian Whipple, and the corresponding licensed manufacturer in concordance with any contract between myself and said licensed manufacturer of the before mentioned Array/Array system. All electricity generated by the installed arrays described in this document will be sold to the appropriately contracted utility company. All revenue generated from advertisements will fall to the sole inventor, myself, Nathan Kirk Ian Whipple, and the licensed manufacturer in the amounts specified in any contract formed between myself and the licensed contractor in concordance to the contract formed. Should an agreement be made in the form in a contract with a non-governmental body specifying that the revenue generated from either electricity or advertisement is by right the claim to the appropriately named, and contracted entity, then all revenue as specified in the contracted agreement will be allotted to said entity.

Installation time is only the time it takes to install the array on site. Does not include time to run HVDC line to transmission station or any other required contact point for the electricity produced. Installation time does not reflect time related to the digging of trenches required prior to installation. Prior to installation of array/arrays a trench (which the array will be placed) will be dug the full length of the system to be installed. Where construction time is estimated at four years (4, 39 week periods) 1 year will be dedicated to the digging of the trench for the full length of the system to be installed. Labor costs will remain the same @ $280,000.00 per week @ 39 workable weeks per year.

DRAWINGS:

Code Index:	Component/Material Association:
A:	Vertical Support
AB:	Horizontal Rotating Central Support
B:	Photovoltaic Cells
BA:	Cell Housing/Bracket Support
C:	Internal Wiring (non-HVDC)
CA:	Wire Connection Points/Box
D:	Advertisement Box
DA:	Advertisement Box Separator/Backing
E:	Electric Motor
F:	Irradiance Sensor
G:	Actuator
H:	Control Box for Comp. housed in vertical left support
I:	HVDC Line
IA:	HVDC Line connection/connector
IB:	HVDC intermediary line
J:	Access Hatches
K:	Concrete Blocks
KA:	Concrete Access Tunnel
L:	Connection Plate
LA:	Bore Hole fore actuator Extension. (Insertion Point)
LB:	Bored Section for internal wire pass through
LC:	Connection from Motor to Central Rotating Array
M:	Bearings
N:	Key Lock
O:	Bolts
P:	Hinges
Q:	Hand Rail "bar" for scaling access hatch

R:	Bore Holes for HVDC line
S:	Plexiglass Covering
T:	Connection point from Cell to Transmission Wire
U:	Angled Protective Side/Underside Sheet
V:	Welding Point
W:	Internal Array Framework
X:	Bearing Housing
Y:	Ground Line (Reference to where level ground is)
Z:	Drainage cutout
1:	Aluminum
2:	Steel
3:	Plexiglass
4:	Concrete
5:	Plastic

Coding Index Format Guide:

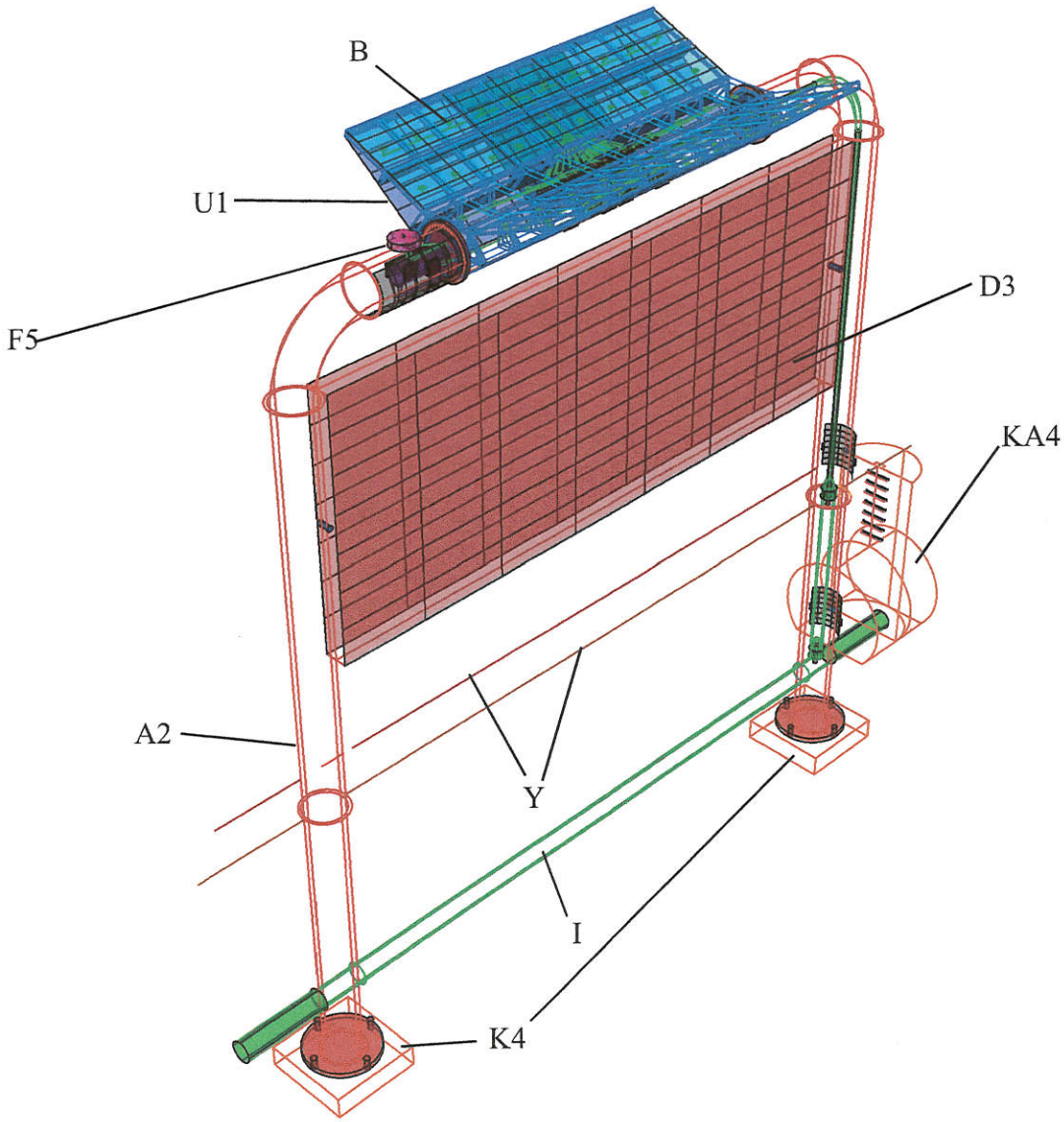
As seen in illustrations Letters equate to the component part being described/identified while numeric value is attributed to the material with which it is made.

Example: A2 = Vertical Support, Steel

Meaning A= the part described, and 2= material which makes up it's composition.

Therefore A2= Vertical support made of Steel.

TITLE: ROADSIDE SOLAR ARRAY
INVENTOR: NATHAN KIRK IAN WHIPPLE
DRAWN BY: NATHAN KIRK IAN WHIPPLE
DATE: 06/23/2013
PAGE:



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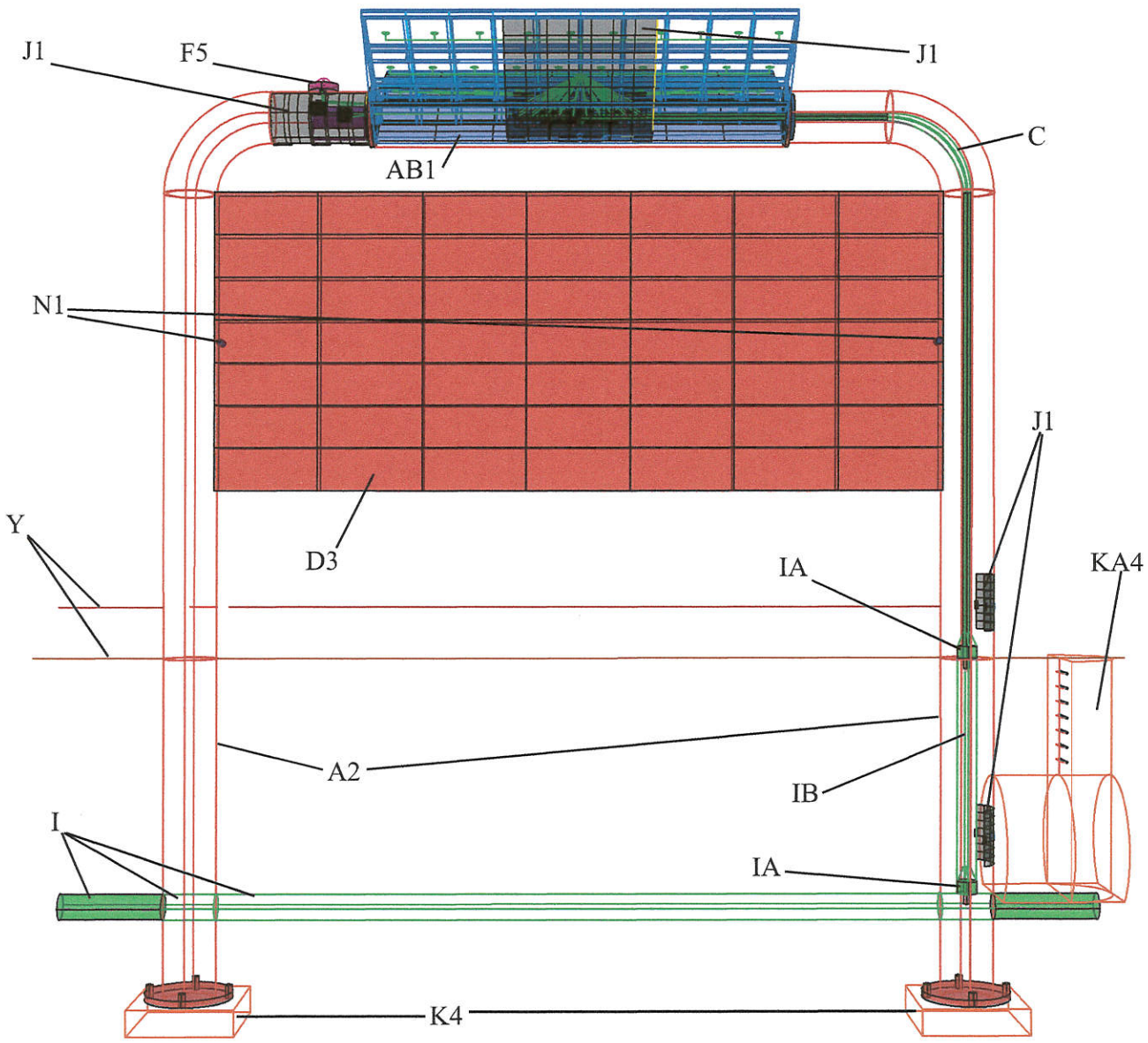

Why the Roadside Solar Array?

The Roadside Solar Array (to which this document is associated) is a cost effective means of energy production teamed with a variety of other useful functions. The ability for this array to be installed along highway and railway mediums allow for relative access to the arrays installed as well as conserving land for future projects or for means of land preservation. The unique ability to generate revenue not only through electrical production, but through advertisements and a variety of other attachments that may come into use later (radar systems, security cameras, and highway alert message boards) allow this unique design to reign supreme among the other comparative methods of energy production.

Not only is the Array system described in this document (and shown in technical drawings attached to this document) a renewable energy source but as mentioned before it is a platform for other business models to capitalize on as well through means of advertisement and highway security and monitoring systems. Revenue generated by arrays can go directly into the further production of other systems in other areas within and outside of the United States. Furthermore with additional revenue generated by the implementation of advertisements it reduces the overall cost to produce the arrays but increasing their effective profitability.

Array systems utilizing the designs provided are also a means for small businesses to "get the word out" about their endeavors by means of advertisement. As a suggested business model accommodations should be made for small businesses to have more affordable advertisement space rental prices relative to the income generated by their business.

Overall the system that has been described in this document is a merger of design and functionality. Not only does it produce renewable energy, but opens up skilled jobs opportunities, and other forms of business enhancement such as advertisements, and even in some circumstances added levels of security on our highway and railway systems where and when the implementation of before mentioned security cameras, radar systems, and roadside alert message boards/screens are put into use.

Thank you for taking the time read through this document, and even more so for future consideration.

Sincerely,

Nathan Kirk Ian Whipple 07/26/2013

Nathan Kirk Ian Whipple, Inventor and Designer of the Roadside Solar Array.
President, Founder, and Sole Owner of Whipple Energy Systems and Technologies L.L.C.

(Patent pending as of June 25th, 2013)

You may contact me @ whipplenathan@gmail.com

Or by cell phone @ 1(209) 403-0529 (preferred contact is by email)

I look forward to any and all future inquiries and interest and will strive to ensure that all required information will be provided as needed. Again, thank you.